



CREATING SUSTAINABLE COMMUNITIES A GUIDE FOR DEVELOPERS AND COMMUNITIES

RENEWABLE ENERGY ALTERNATIVES

Renewable energy is energy obtained from resources that are essentially inexhaustible, including the wind, sun, living organisms or their by-products (biomass), the earth's own internal heat (geothermal), and the movement of water (hydro, wave, and tidal). Renewable resources can be used to generate thermal energy and/or electricity. While there is a common notion that renewable energy always costs more than energy from conventional sources, it is recognized that under the right conditions, this is not necessarily the case. An increasing number of businesses, institutions, organizations and home owners are switching to renewable resources in order to *reduce* their energy costs.

Also, if applied using current strategies, renewables will generate other benefits that include: (a) increasing the flexibility of power systems as electricity demand changes, (b) reducing pollution and emissions from conventional energy systems, and (c) reducing dependency and minimizing expenditure on imported fuels. Moreover, many renewable energy technologies are suited to small off-grid applications, e.g., Island Beach State Park. Such small energy systems can contribute to the local economy and create local jobs involved in manufacturing, installation and servicing.

A number of renewable energy technologies, or the energy they produce, are available to NJ communities, developers, businesses, institutions and residents. These include¹ solar technologies, photovoltaic technologies, wind energy, geothermal technologies, , and methane gas from landfills or a biomass facility (provided that the biomass is cultivated and harvested in a sustainable manner), and electricity produced at a resource recovery or hydropower facility

APPLICABLE NEW JERSEY GOALS AND TARGETS

Reduce projected energy use by 20% by 2020 and meet 20% of the state's electricity needs with Class I renewable energy sources by 2020 (NJ Energy Master Plan).

Stabilize GHG emissions at 1990 levels by 2020/ Reduce emissions to 80% below 2006 levels by 2050 (E.O. 54; NJ Global Warming Response Act, P.L.2007, c.112).

SUGGESTED ACTIONS AND STRATEGIES

Renewable Energy On-Site Generation

Adopt community energy approach - While on-site generation could be undertaken by an individual homeowner, business or project developer, this effort can be pursued more effectively through a community energy approach. "Community energy" means development of these clean resources with substantial community ownership and involvement. Project size can vary widely, especially given the range of efficiency and renewable technologies, but historically these projects have capacities of up to 20 megawatts (MW)(or roughly \$20 million in purchase and installation costs). For housing or other types of building developers, renewable energy considerations can include integration of renewable technologies into building design and structure, cooperation with the municipality (or similar entity) to collaboratively develop and manage a community energy system, or independent development and management of a community-scale energy system. Renewable energy projects can also include a combination of various technologies as feasible.



Conduct renewable energy project identification, scoping and planning - The first steps taken to identify and initiate a community-scale renewable energy project are critical and should include methodically researching and evaluating a wide range of possibilities until the most promising set of actions is determined. A project plan is a useful tool to formally initiate the project and take the first steps. If the project is complicated, the overall project plan may be composed of several sub-plans including:

Technical Plan: All renewable energy projects have a number of technical factors to consider. These include the “load” (energy demand) the project aims to satisfy, the resource data (characteristics of primary energy source, e.g., wind or solar conditions as the case may be), technology performance, electrical interconnection (i.e., if the project expects to generate excess electricity and plans to sell it to utility serving the area and/or as back-up power source), site access and constructability, construction design, and forecasts of expected production.

Permitting Plan: Depending on the scale of the proposed project, regulatory permits, including building permits, may be required. These are issued by both state and local governments and influenced by what kind of entity owns the site and how it is zoned. A permitting plan includes surveys of the site property for environmental and other purposes, translation of technical factors into a permissible project layout, and a schedule for filings and hearings.

Community Education Plan: Energy projects may affect people outside of the site boundary, so this plan focuses on how and when local stakeholders will be informed and consulted with about the project.

Consider wind energy if suitable - If undertaken by a community, wind power development will mean locally-owned projects, consisting of one or more utility-scale turbines or a cluster of small turbines that are interconnected on either the customer or utility side of the meter. Community wind projects are usually less than 10 MW in size. Larger projects begin to encounter a set of development, financing, design, permitting and construction challenges that closely resemble those encountered by larger, commercial projects. Technical details can be accessed from resources available at the American Wind Association website (www.awea.org/). The NJ Clean Energy Program has convened a Small Wind Working Group which is developing a *model ordinance* addressing small wind energy systems for NJ municipalities.

Consider solar energy if appropriate - Solar energy can be harnessed to generate electricity using photovoltaics (PV), to heat water (solar hot water technologies), and to heat building spaces (passive solar technologies). Solar energy technologies come in all sizes. Some utilities are investing in large-scale solar power plants, but solar is often used as the smallest-scale of renewable energy applications. Aside from being a clean, renewable energy source, solar energy has unique value as a form of *distributed generation* (electricity generated from many small energy sources). Please see related fact sheets on *Passive Solar Energy Design –New Development* and *Active Solar Technologies—Existing and New Development* for further information.

Solar energy’s ability to be utilized on-site allows for smaller systems that provide cumulative results in a community. Community solar is less defined by the size of a single installation than by the cumulative benefits that go beyond any one private business or citizen. Examples of community solar energy include: (a) a cluster of installations in a community where solar energy, encouraged by facilitating municipal policies, provides exceptional value; (b) solar cooperative as part of a green power program; and, (c) solar on public or non-profit facilities that serve the community, funded via a specific green power program.

Investigate bioenergy and geothermal possibilities - Communities that do not have sufficient wind or solar resources and have access to significant biomass resources (e.g., agricultural, forestry, or waste materials, crops or residues) may want to investigate bioenergy.



BioEnergy or Biomass is a form of stored solar energy. Plants absorb energy from the sun and convert it into cellulose. This cellulose, or plant matter, is one type of biomass that can be used to create usable energy. Typically biomass energy production can be divided into the categories of *biopower* (for electricity generation) and *biofuels* (for petroleum substitutes often used in transportation applications). Some of the forms of biomass commonly used to produce energy are: wood, corn, and soybean; however, significant progress is being made to commercialize other types of fast-growing, non-food crops for energy use (e.g., switch grass). The biomass resource must be harvested sustainably to be considered a renewable resource. Waste products such as wood wastes, animal waste, municipal solid waste, and methane from landfills and wastewater facilities are also potential sources of energy.

Geothermal energy is heat derived from the earth that can be harnessed for a variety of functions including electricity production, direct heat, and heat pump use. The potential use of geothermal energy depends on the resource's temperature, generally determined to be in one of three classes: low temperature (less than 195 degrees F), (b) moderate temperature (195 to 300 degrees F), and (c) high temperature (300 degrees F and greater). According to USDOE, New Jersey has low to moderate temperature resources that can be tapped for direct heat or for geothermal heat pumps. However, electricity generation is not possible with these resources.

Uses for low and moderate temperature resources include direct use and ground-source heat pumps. *Direct Use*: Direct use of a geothermal resource means using the groundwater's heat (directly) without a heat pump or power plant. Examples of uses include space heat and cooling for buildings, district heating (18 systems in the western states), agriculture (soil and greenhouse warming), and industrial (product heating or drying)(hot springs are another geothermal resource but these do not occur in NJ). *Ground-Source*: Ground-source heat pumps use the earth or groundwater as a heat source in the winter and a heat sink in the summer, thus lowering heating and air conditioning costs, respectively. Heat pumps are the most universally applicable geothermal technology, as the low temperatures required are available worldwide. For more information on geothermal energy, visit <http://geoheat.oit.edu/>

Develop relationships with Utilities for renewable resources - In certain instances, electricity produced by on-site renewable energy systems may be more than what the community needs or consumes. Thus there is a need to dispose or sell excess electricity. Accordingly, renewable project owners and/or developers will need to work with electric utilities in two primary ways. First, they must reach an agreement on how a project will interconnect with the local utility or other distribution or transmission provider. Second, and often related, the project developer must decide who will purchase the surplus energy from the project; in most cases this will be a utility, whether it is sold to the local utility or "wheeled" to another utility's service territory. In some cases, all of the power from a renewable project will be used by a customer on-site, but even in that case, it is important to have a good understanding of the impact of the project on the local utility's system.

Purchase Off-Site Renewable Energy

Renewable energy may also be sourced off-site and purchased to supply the power needs of a given community through a *green power pricing program*. This is a voluntary option offered by utilities that allows customers to support new investments in renewable energy technologies. Generally, this environmentally preferable electricity costs a little more than traditional power generated from sources such as coal, natural gas, large hydropower and nuclear fuels. Green power customers pay a green rate (typically at a premium above the cost of regular electric service) on their electric bills to cover the higher cost of renewable energy. The median green pricing charge is about 2.5 cents/kWh (and can range from 1.3 cents to 5.5 cents more per kilowatt hour). In NJ, the **CleanPower Choice Program** (within the NJ Clean Energy Program) allows consumers to purchase a portion or all of the electricity they use from renewable sources.



Customers may also opt to use the *green power check-off program*. In this program, a customer makes a voluntary purchase of Renewable Energy Certificates (RECs) from a third-party supplier as an add-on subscription to existing electricity service. A REC represents the property rights to the environmental benefits from generating electricity from renewable energy sources. This is different from green power pricing programs in that the customer makes the purchase of RECs from a utility-approved third party supplier, rather than from the utility itself. The customer's electricity needs continue to be met by his/her traditional supplier. RECs are supplied by one or more qualified vendors. The purchased RECs can match a percentage of the customer's monthly electricity use or can be a fixed monthly amount. This program is now being offered throughout New Jersey.

STATE TECHNICAL/FINANCIAL ASSISTANCE

The NJ Clean Energy Program has an existing Customer On-Site Renewable Energy Rebates (CORE) program. Consumer incentives are available to residential customers. The costs of installation, equipment, and interconnection are paid incrementally based on the size of the system. See www.njcep.com/html/2_incent.html. However, please note that the BPU's queue for funding is extremely long due to high levels of program popularity.

Residential and small commercial customers installing grid-connected solar technologies are offered *net metering* under the state's Electric Discount and Energy Competition Act (EDECA) up to 2 MW capacity. Utilities credit the customer at the full retail rate for each kilowatt-hour produced by a Class I renewable energy system installed on the customers' side, up to the total amount used by that customer during an annualized period. Beyond that amount, utilities pay wholesale. Customers may also apply to the Board of Public Utilities (BPU) to participate in NJ's Solar Renewable Energy Certificates (S-RECS) program, which provides a means for solar certificates to be created and verified and allows the certificates to be sold to electric suppliers to meet their solar Renewable Energy Portfolio Standards (RPS) requirement. (www.njcleanenergy.com/renewable-energy/home/home)

FURTHER INFORMATION

NJ Clean Energy Program Renewable Energy web page - www.njcleanenergy.com/renewable-energy/home/home

For more information on purchase of off-site renewables in New Jersey, visit the NJ Clean Power/Clean Choice program www.njcleanenergy.com/residential/programs/cleanpower-choice/new-jersey-cleanpower-choice-program

US Department of Energy's Energy Efficiency and Renewable Energy Program - www.eere.energy.gov/
For federal financing assistance, see: www1.eere.energy.gov/financing/

Green Pricing Resource Guide - www.awea.org/greenpower/greenPricingResourceGuide040726.pdf

Community Energy Project Planning guidance - www.nwcommunityenergy.org/project-design-management

Wind energy guide for county commissioners - www.nrel.gov/docs/fy07osti/40403.pdf

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